CLAIMS

The embodiments of an invention in which an exclusive property or right is claimed are defined as follows:

1.   A passive close formation collision avoidance system for a host aircraft,

2 the system comprising:

data link transponder means, said transponder means generating and

4 transmitting broadcast data, the broadcast data comprising aircraft position

information of the host aircraft; and

6   traffic alert and collision avoidance system (TCAS) computer means in

communication with said transponder means for receiving and processing

8 broadcast data from a second data link transponder means located onboard

other aircraft to determine relative aircraft position of the host aircraft with respect

10 to the other aircraft.

2.   The system of Claim 1, wherein the TCAS computer means is passive.

3.   The system of Claim 1 further comprising display means for displaying

data to an operator of the host aircraft.

4.   The system of Claim 3, wherein the relative velocity of the other aircraft

are displayed on the display means.

5.   The system of Claim 1, wherein said transponder means is a mode-select

data link transponder.

6.   The system of Claim 1, wherein the broadcast data is automatic

dependent surveillance broadcast (ADS-B) data.

7.   The system of Claim 1, wherein the broadcast data is global positioning

system (GPS) data.

8.   The system of Claim 1, wherein the broadcast data is Mode-S squitter data.

9.   The system of Claim 1, wherein the broadcast data is extended squitter airborne position data.

10.   The system of Claim 1, wherein the broadcast data is extended squitter airborne velocity data.

11.   The system of Claim 1, wherein the broadcast data is continuously transmitted by the data link transponder means at a predetermined interval.

12.   The system of Claim 1, wherein said TCAS computer means comprises a radio frequency power step attenuator.

13.   The system of Claim 1 further comprising a mission computer, and wherein said TCAS computer means comprises an input/output interface, the input/output interface providing a data interface from said TCAS computer means to the mission computer.

14.   A passive intra-formation positioning collision avoidance system for a

2   transponder-equipped host aircraft, the system comprising:

    a data link transponder, said transponder generating broadcast data, the

4   broadcast data comprising aircraft position; and

    a traffic alert and collision avoidance system (TCAS) computer in

6   communication with said transponder for receiving and processing the broadcast

    data from said transponder;

8   a mission computer unit in communication with said TCAS computer,

    wherein said mission computer unit receives the broadcast data from said TCAS

10   computer and generates steering commands based on the broadcast data; and

a communication link in communication with said mission computer to

12   transmit the steering commands to at least one other transponder-equipped

aircraft for processing, the at least one other transponder-equipped aircraft being

14   responsive to the steering commands to position itself with respect to the host

aircraft.

15.   The system of Claim 14, wherein the TCAS computer means is passive.

16.   The system of Claim 14, wherein the communication link is a very high

frequency (VHF) data link.

17.   The system of Claim 14, wherein the communication link is an ultra-high

frequency (UHF) data link.

18.   The system of Claim 14, wherein the relative velocity of the plurality of

aircraft are displayed on a display means.

19.   The system of Claim 14, wherein the at least one other transponder-

equipped aircraft is further equipped with station keeping equipment means for

receiving and processing the steering commands to position the at least one

other transponder-equipped aircraft with respect to the host aircraft, the station

keeping equipment being responsive to the steering commands.

20.   The system of Claim 14, wherein the at least one other transponder-

equipped aircraft is further equipped with automatic flight control station means

for receiving and processing the steering commands to position the at least one

other transponder-equipped aircraft with respect to the host aircraft, the

automatic flight control station means being responsive to the steering

commands.

21.   The system of Claim 14, wherein the steering commands comprise

commands used to maintain horizontal and vertical separation between the at least one other transponder-equipped aircraft and the host aircraft within a predefined airspace cell.

22. The system of Claim 14, wherein the at least one other transponder-equipped aircraft is identifiable by a unique Mode-S address identifier.

23. The system of Claim 14, wherein the broadcast data is automatic dependent surveillance broadcast (ADS-B) data.

24. The system of Claim 14, wherein the broadcast data is global positioning system (GPS) data.

25. The system of Claim 14, wherein the broadcast data is Mode-S squitter data.

26. The system of Claim 14, wherein the broadcast data is extended squitter airborne position data.

27. The system of Claim 14, wherein the broadcast data is extended squitter airborne velocity data.

28. The system of Claim 14, wherein said TCAS computer comprises an input/output interface, the input/output interface providing a data interface from said TCAS computer means to the mission computer unit.

29. The system of Claim 14 further comprising display means for displaying informational data to an operator of the host aircraft, the informational data comprising the relative velocity of the other aircraft.

30. A passive collision avoidance method for aircraft flying in formation with
2   respect to one another, the method comprising the steps of:

    providing a transponder, the transponder generating and transmitting

4   broadcast data, the broadcast data comprising aircraft position; and

       providing a traffic alert and collision avoidance system (TCAS) computer

6   onboard a host aircraft, the TCAS being in communication with said transponder

     for receiving and processing the broadcast data from the transponder.

   31.   The method of Claim 30 further comprising the step of positioning the

     aircraft with respect to one another while flying in formation based on the

     broadcast data.

   32.   The method of Claim 30 further comprising the steps of:

2   providing a mission computer in communication with the TCAS computer;

       transmitting the broadcast data from the TCAS computer to the mission

4   computer;

       processing the broadcast data; and

6   selectively transmitting the processed broadcast data between the aircraft

     via a data link.

   33.   The method of Claim 30 further comprising the step of providing automatic

     flight means for positioning and separating the aircraft with respect to one

     another based on the processed broadcast data.

   34.   The method of Claim 30 wherein the step of selectively transmitting

     comprises the step of selecting a particular aircraft to receive the processed

     broadcast data based on a unique flight identifier of the particular aircraft.

   35.   The method of Claim 30, further comprising the steps of alerting an

     operator of the aircraft when an intruder penetrates a predefined perimeter of

     aircraft flying in formation.

   36.   The method of Claim 30, further comprising the step of inhibiting air traffic

control radar beacon systems (ATCRBS) messages from being sent by the transponder.

37.   The method of Claim 32, wherein the step of processing the broadcast data comprises the step of calculating target range, range rate, relative altitude, altitude rate, and bearing from the broadcast data received from the transponder to determine whether an aircraft is intruding upon a predefined airspace of the host aircraft.